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Type B

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= Abstract =

Treatment of Type IIIB Open Tibial Shaft Fractures

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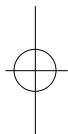
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In general, severe open fractures of the tibial shaft have been treated initially with external fixation. However, despite many refinements in this technique, it has been associated with numerous complications, including problems at the sites of pins, non-union, delayed union, malunion, and infection. The purpose of this retrospective study is to analyze the results in a consecutive series of patients. There were 8 males and 2 females with an average age of the 44.9 years(range, 26-64 years). The mean follow up period was 23.2 months(range, 12-36 months). The external fixation had been maintained for an average of 70.4 days(range, 34-120 days). Free flap procedures were performed on all patients. The average time between removal of the fixator and intramedullary nailing was 16.5 days(range, 11-26 days). Indication of conversion to nailing was absence of any serous discharge, redness or local heating around pin-sites and normal range of laboratory data. All 10 fractures had united with additional bone graft in 7 cases. The most frequent complications were delayed union in 7 cases and infection(superficial infection: 6

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cases, osteomyelitis: 1 case) after IM nailing. We concluded that pin-tract infection is the major cause of infection after IM nail, but duration of external fixation and time interval(between removal of external fixator and nailing) are not isolated factors.

Key Words : Type IIIB open tibial shaft fractures, Osteomyelitis, External fixation, Free flap, Secondary nailing

5 (50%), 3 (30%)
(Table 1).

가 12
가 3 (30%) 7 (70%) 12 48
가 10 monofixator Extor
(3 6 mm Schanz screws
2,3,6,8,10-13)
가 70.4 (, 34-
1994 2 1997 2 120)
10 Type IIIB 1-2
4),
2 cephalosporin aminoglycoside
10
가 3 (30%)
14.4 (, 7-21)
1994 2 1997 2 Gustilo Anderson⁷⁾
Type IIIB 16.5(, 11-26)
15 15 . 5 1
가 10
12
36 23.2 . 10 가
30 3 (30%), 40 50 , 60 가 2 10 9 Brooker-Wills nail
(20%) 20 가 1 (10%), 가 8 (Biomet, US)
(80%), 2 (20%)
가 9 (90%) , 1 9
(10%) . 1
5 (50%),



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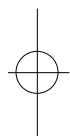
Table 1. Patients Profile

Case*	Age/Sex (years) Time in	fixator	Time interval [†] (days)	Infection after IM nailing [‡]	Time of union (months)	No. of other injuries
1	41/F	86	16	SI	11	2
2	54/F	120	26	OM	12	1
3	26/M	34	11	SI	6	2
4	33/M	43	14	None	10	0
5	35/M	49	22	SI	7	1
6	36/M	54	17	SI	6	2
7	44/M	87	21	None	9	1
8	54/M	58	12	SI	6	2
9	62/M	98	14	SI	7	1
10	64/M	75	12	None	8	1

* All 10 cases were Type IIIB open tibial shaft fractures by classification system of Gustilo and Anderson

[†]Time interval between removal of external fixator and IM nailing

[‡]SI: superficial infection, OM: osteomyelitis



Interax nail (Howmedica, 5).

US)

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가 가 12).

.

가 10

가 , 6

, , 가

가 8.2 (6-12)

6 (60%)

72 (, 43-87) 5

가 .5

1).

38 (22-56)

6

.

1



가
12
가
7
가
12
2
10°
0°
3
8)
3
54
Gustilo-Anderson type IIb⁷⁾
(Fig 1). 4
(Fig 2-A)
1-2
22

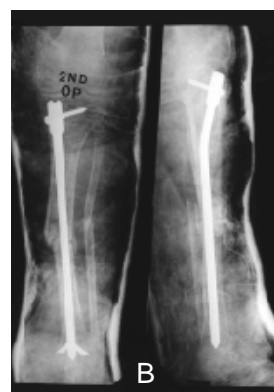
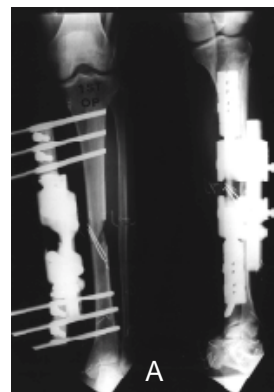


Fig 2-A. External fixation was followed by secondary closure with free flap on the twenty-two day after injury.

B. The postoperative radiographs show the fracture fixed with Brooker-Wills nail (Biomet, US) in 9° valgus position.

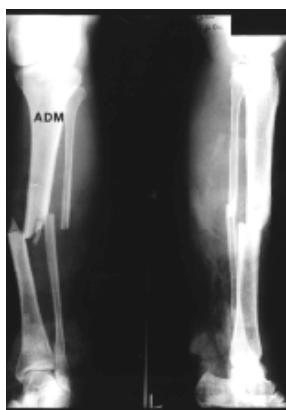
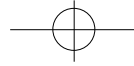


Fig 1. A fifty-four-year-old woman sustained a Type IIIB open tibial shaft fracture in a car accident.



Fig 3. The final radiographs taken at 12 months after external fixation show fracture union with bridging callus.



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120 7 3
26 71.2 68.3 가 .
(Fig 2-B).
1 가
7
12
(Fig 3). Maurer ¹¹⁾ 24

1975 Karlström Olerud⁹⁾가

Blachut ²⁾ 39

가

2

2,3,11-14)

1

McGraw Lim¹²⁾ 16

2,11,12)

3 (10 -12)

6 (60%)

7

7 1

6 5

1

6

7

Blachut ²⁾

17

39 2 (5%)

16.5 (, 11-26)

가 가

7

16.9 (, 11-26

Maurer ¹¹⁾

9.3

12-21)

가

15.7 (,

가

10

가

McGraw Lim¹²⁾

16

70.4 (, 34-120)

15

7 (44%)

, Blachut ²⁾



39 3 (7.6%)

가

9
, 9 6

1

가

1) , , , , :
Ilizarov

가

, 32:897-904, 1997.

16 50% 44% McGraw Lim¹²⁾

, Blachut²⁾ 39 2
36

6 Maurer¹¹⁾

7 (70%) 가

9.1 (, 7-12)

(60%)

2) **Blachut PA, Meek RN and O'Brien PJ** : External fixation and delayed intramedullary nailing of open fractures of the tibial shaft. *J Bone Joint Surg*, 72-A:729-735, 1990.

3) **Bone LB and Johnson KD** : Treatment of tibial fractures by reaming and intramedullary nailing. *J Bone Joint Surg*, 68-A:877-887, 1986.

4) **Burgess AR, Poka A, Brumback RJ and Bosse CMJ** : Management of open grade III tibial fractures. *Orthopedic Clinics N Am*, 18:85-93, 1997.

5) **Goulet JA and Templeman D** : Delayed union and nonunion of tibial shaft fractures. *Instructional Course Lectures*, 46:281-291, 1997.

6) **Edge AJ and Denham RA** : External fixation for complicated tibial fractures. *J Bone Joint Surg*, 63-B(1):92-97, 1981.

7) **Gustilo RB and Anderson JT** : Prevention of infection in the treatment of one thousand and twenty-five open fractures of long bones. *J Bone Joint Surg*, 58-A:453-458, 1976.

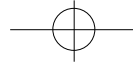
8) **Holbrook JL, Swiontkowski MF and Sanders R** : Treatment of open fractures of the tibial shaft. Ender nailing versus external fixation. *J Bone Joint Surg*, 71-A:1231-1238, 1989.

9) **Karlström, G and Olerud, S** : Percutaneous pin fixation of open tibial fractures. Double-frame anchorage using the Vidal-Adrey method. *J Bone Joint Surg*, 57-A:915-924, 1975.

10) **Lawyer RB and Lubbers LM** : Use of the Hoffmann apparatus in the treatment of unstable tibial fractures. *J Bone Joint Surg*, 62-A:1264-1273, 1980.

10





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- 11) **Maurer DJ, Merkow RL and Gustilo RB** : Infection after intramedullary nailing of severe open tibial fractures initially treated with external fixation. *J Bone Joint Surg*, 71-A:835-838, 1989.
- 12) **McGraw JM and Lim EVA** : Treatment of open tibial-shaft fractures. External fixation and secondary intramedullary nailing. *J Bone Joint Surg*, 70-A:900-911, 1988.
- 13) **Puno RM, Teynor JT, Nagano J and Gustilo RB** : Critical analysis of results of treatment of 201 tibial shaft fractures. *Clin Orthop*, 212:113-121, 1986.
- 14) **Wiss DA, Segal D, Gumbs VL and Salter D** : Flexible medullary nailing of tibial shaft fractures. *J Trauma*, 26:1106-1112, 1986.

